Nanocarbon–Based Photovoltaics:

Supporting Information

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This supplementary information includes:

Supplementary Figures S1–S3 with brief accompanying text.

Supplementary Figure S1

Figure S1 shows the Schottky barrier (SB) for O concentrations in the 10 – 20 at. % range, for the cases of rGO / PCBM (n–type SB, red curve) and rGO / s–SWCNT (p–type SB, blue curve) calculated for the (14,0) SWCNT with diameter 1.1 nm.

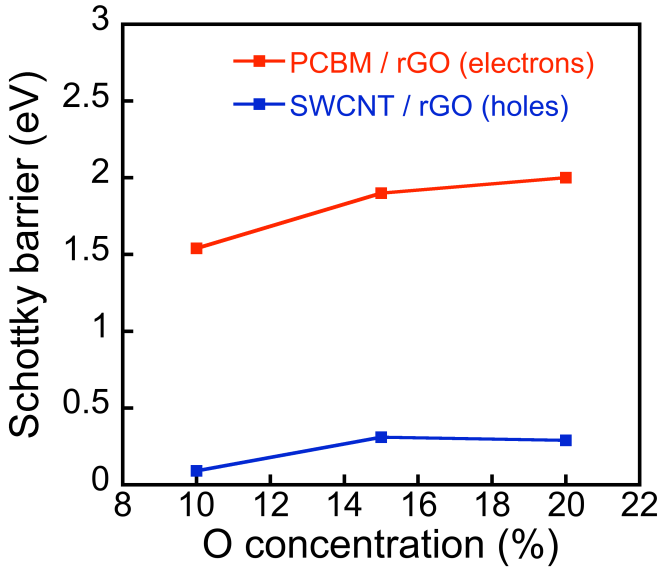
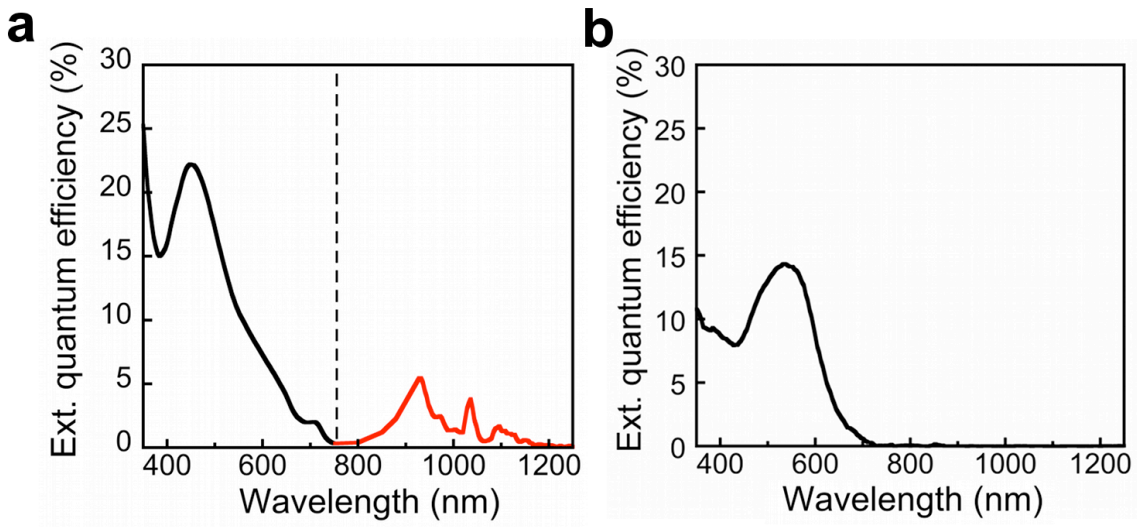


Figure S1. Schottky barrier (SB) for electrons at the PCBM / rGO interface (red curve). SB values larger than 1 eV prevent injection of photogenerated electrons from PCBM to rGO, thus leading to selective injection of photogenerated holes from PCBM to rGO. Holes can also be injected from rGO to SWCNT due to the low SB value of 0.1–0.2 eV (blue curve). A cascade transport of holes from PCBM to rGO to s-SWCNT can thus be generated upon photoexcitation of PCBM, as shown in Figure 1d of main text.

Supplementary Figure S2

We show below EQE curves for devices with small diameter (d = 0.75 – 1.2 nm) s-SWCNT and PCBM, both without rGO (Figure S2a) and with rGO (Figure S2b). They refer to the entries marked with (*) in Table 1 of main text. We note contributions from both the PCBM absorption in the visible and the nanotube absorption in the infrared for the PCBM / s-SWCNT sample without rGO, similar to the large diameter devices shown in Figure 1 of main text. In the sample with rGO, no contribution from the nanotubes is seen (see main text for discussion).



Supplementary Figure S3

Measured photodegradation of best-efficiency s–SWCNT / $PC_{70}BM$ / rGO solar cells, as described in main text. Figure S3 shows the evolution of J_{sc} , V_{oc} , FF and of the power conversion efficiency upon aging of a non–encapsulated device in air.

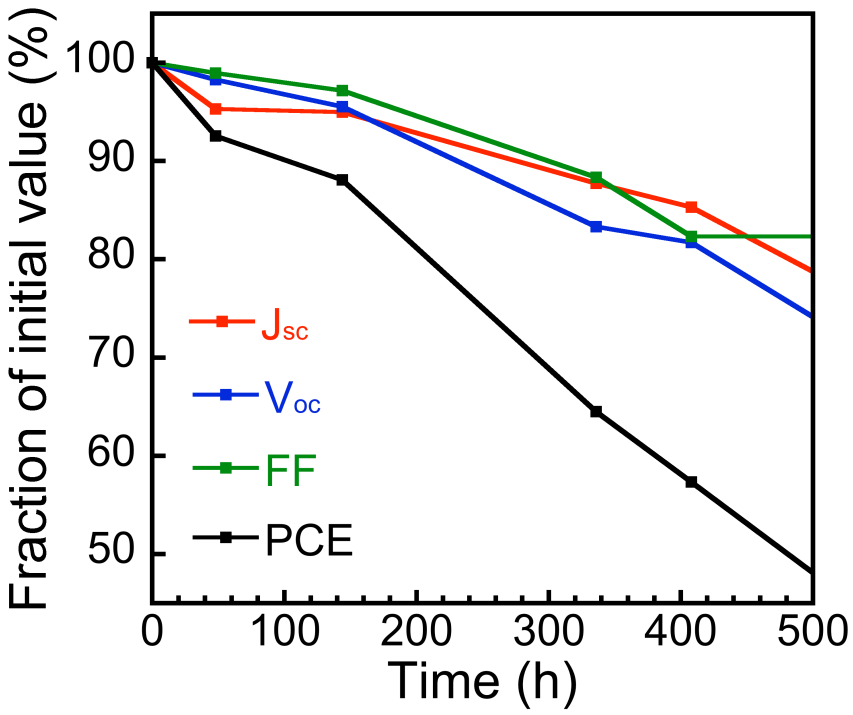


Figure S3. Evolution of device characteristics. J_{SC} , V_{OC} and FF all degrade at a similar rate in non–encapsulated carbon–based devices containing s–SWCNT / $PC_{70}BM$ / rGO in the active layer. PCE is the power conversion efficiency.